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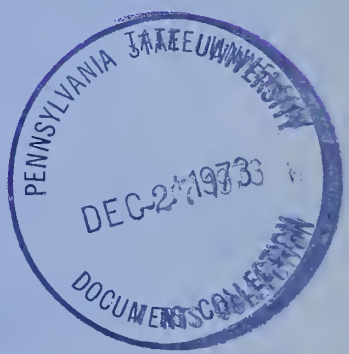
U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Marine Flora and Fauna of the Northeastern United States. Pycnogonida

LAWRENCE R. McCLOSKEY



SEATTLE, WA
September 1973

National Marine Fisheries Service, Circulars

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U.S. DEPARTMENT OF COMMERCE
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LAWRENCE R. McCLOSKEY

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FOREWORD

This issue of the "Circulars" is part of a subseries entitled "Marine Flora and Fauna of the Northeastern United States." This subseries will consist of original, illustrated, modern manuals on the identification, classification, and general biology of the estuarine and coastal marine plants and animals of the Northeastern United States. Manuals will be published at irregular intervals on as many taxa of the region as there are specialists willing to collaborate in their preparation.

The manuals are an outgrowth of the widely used "Keys to Marine Invertebrates of the Woods Hole Region," edited by R. I. Smith, published in 1964, and produced under the auspices of the Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Mass. Instead of revising the "Woods Hole Keys," the staff of the Systematics-Ecology Program decided to expand the geographic coverage and bathymetric range and produce the keys in an entirely new set of expanded publications.

The "Marine Flora and Fauna of the Northeastern United States" is being prepared in collaboration with systematic specialists in the United States and abroad. Each manual will be based primarily on recent and ongoing revisionary systematic research and a fresh examination of the plants and animals. Each major taxon, treated in a separate manual, will include an introduction, illustrated glossary, uniform originally illustrated keys, annotated check list with information when available on distribution, habitat, life history, and related biology, references to the major literature of the group, and a systematic index.

These manuals are intended for use by biology students, biologists, biological oceanographers, informed laymen, and others wishing to identify coastal organisms for this region. In many instances the manuals will serve as a guide to additional information about the species or the group.

Geographic coverage of the "Marine Flora and Fauna of the Northeastern United States" is planned to include organisms from the headwaters of estuaries seaward to approximately the 200-m depth on the continental shelf from Maine to Virginia, but may vary somewhat with each major taxon and the interests of collaborators. Whenever possible representative specimens dealt with in the manuals will be deposited in reference collections of the Gray Museum, Marine Biological Laboratory, and other universities and research laboratories in the region.

After a sufficient number of manuals of related taxonomic groups have been published, the manuals will be revised, grouped, and issued as special volumes. These volumes will thus consist of compilations of individual manuals within phyla such as the Coelenterata, Arthropoda, and Mollusca, or of groups of phyla.

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MARINE FLORA AND FAUNA OF THE NORTHEASTERN UNITED STATES. Pycnogonida

LAWRENCE R. McCLOSKEY[1]

ABSTRACT

The manual includes an introduction on the general biology, an illustrated key, an annotated systematic list, a selected bibliography, and an index to the Pycnogonida along the coast of the United States from Maine to New Jersey out to 100 m.

INTRODUCTION

The Pycnogonida, or sea spiders, are one of the most curious groups of marine invertebrates. Their peculiar anatomy, a montage of arthropod characters, reveals no clear affinities or homologies with other apparently related arthropods (Fig. 1). Generally, the first pair of pycnogonid appendages are formed into pincerlike chelifores (sometimes called chelicerae or mandibles), and the second pair develop as sensory palps (or pedipalps). In addition to these two pairs of appendages, used mostly in feeding, the first segment of the body usually has two pairs of legs. The first pair (when present) are called ovigers, and, in the male, are used to hold and carry the clusters of eggs. (However, in one family, the Colossendeidae, the "ovigers" are used only as grooming appendages.) The second pair on the first body segment are walking legs—the first of four pairs used for locomotion. The legs often comprise the bulk of the animal's body mass, and in keeping with unconventionality, have nine segments, rather than the eight usually found in arthropods. An extra somite (that is, body segment), with legs, appears in some species, resulting in a total of 10 legs. Two species are known which have 2 extra somites and 12 legs. The appendages are never biramous. The abdomen is quite rudimentary and possesses only the anal opening.

Though superficially spiderlike, pycnogonids do not have the typical arachnid body arrangement of a cephalothorax (or prosoma) with six legs and a large abdomen (or opisthosoma). They differ clearly from the classes Merostomata and Arachnida in having no respiratory or excretory organs, in having the mouth located at the end of a proboscis, and in having multiple gonopores which open on the legs. They show affinity to the chelicerates in the arrangement of the brain which has a protocerebrum and a tritocerebrum, without a deuterocerebrum. Hence, they have been placed in a separate class, Pycnogonida, under the subphylum Chelicerata.

Within the range covered by this manual (Maine to New Jersey), five species of pycnogonids may be readily found in nearshore waters: *Tanystylum orbiculare, Callipallene brevirostris, Phoxichilidium femoratum, Anoplodactylus lentus,* and *Pycnogonum littorale.* It is these species which have received the most attention. Thomas Hunt Morgan's treatise (1891) on the embryology of pycnogonids, treats *Tanystylum orbiculare* (p. 4-8, 36-48), *Callipallene brevirostris* (p. 8-22 under *Pallene empusa*), and *Anoplodactylus lentus* (p. 4-8 under *Phoxichilidium maxillare*). The habits of *Anoplodactylus lentus* have been examined by Cole (1901, p. 195-206; 1906, p. 740-741), its blood was studied by Dawson (1934, p. 62-68), and its muscles by Jordan (1916). *Phoxichilidium*

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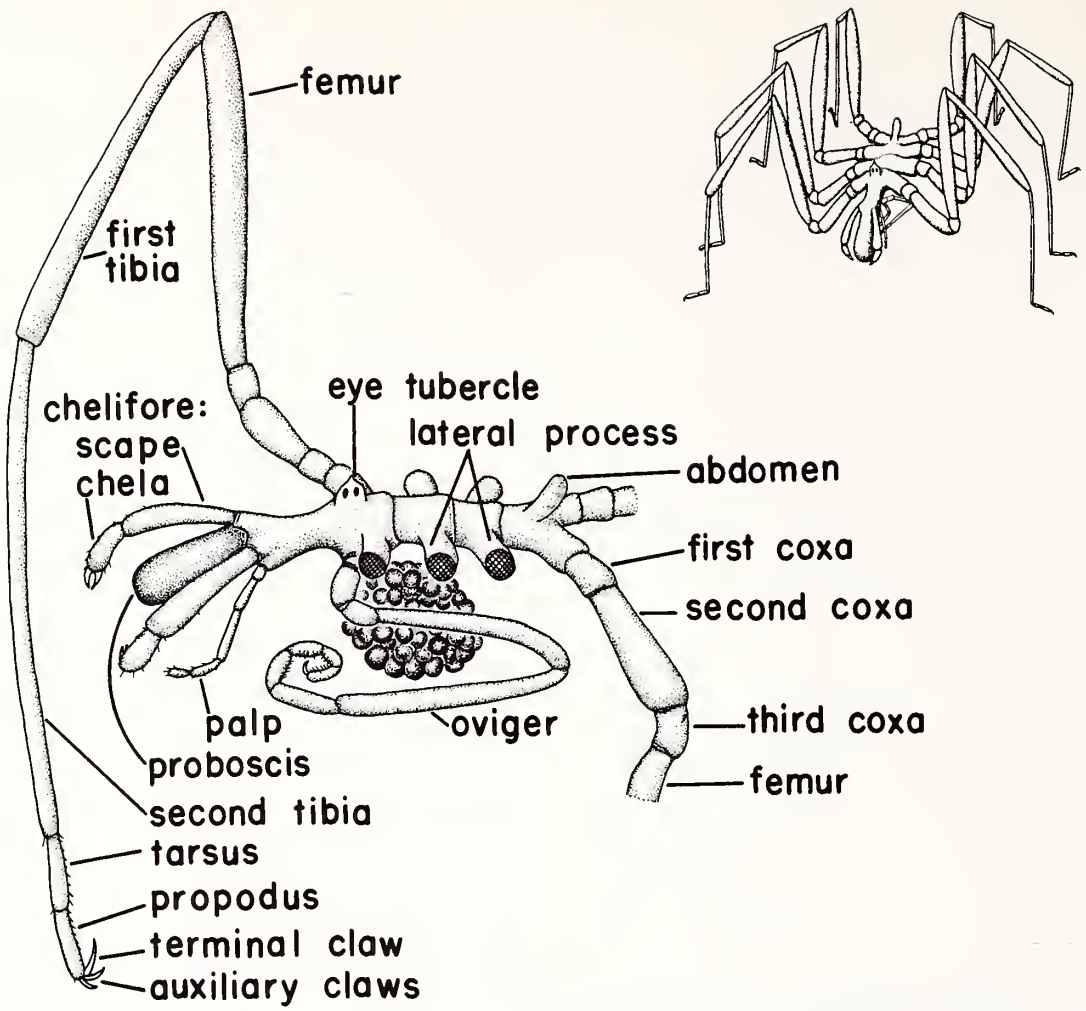


Figure 1.—Anatomy of a typical Pynogonid. Inset: anterior view of whole animal.

femoratum and *Tanystylum orbiculare* have been less well studied, though *P. femoratum* is well known to live on *Tubularia*, and its young produce parasitic galls on the hydroids. *Pycnogonum littorale* is reported to associate with sea anemones (Prell, 1909).

The remainder of the species in this key are found primarily in deeper water, and, as expected, less is known of their habits. Species heretofore collected only deeper than 100 m have not been included, but some may yet appear in collections from near the shelf edge.

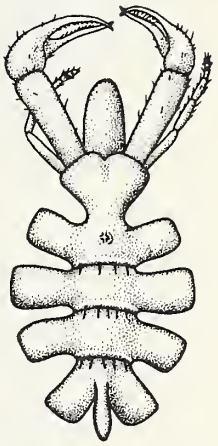
No new species have been reported from this area since Joel W. Hedgpeth's (1948) comprehensive systematic treatment. It was from this work that much of the material in the key is derived. I wish to thank Dr. Hedgpeth for his kindness in permitting us to draw so heavily on his paper and allowing us to reproduce many of his drawings.

Primary taxonomic characters for the pycnogonids are combinations of presence or absence of chelae, palps, and ovigers. The number of segments per appendage is also important. Figure 1 portrays a generalized sketch of a pycnogonid, illustrating characters used in the key, and the inset depicts the lifelike appearance of a whole animal.

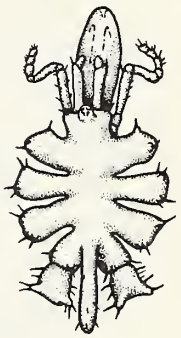
KEY TO THE PYCNOGONIDA, MAINE TO NEW JERSEY

1 Chelifores and palpi distinctly present. 2

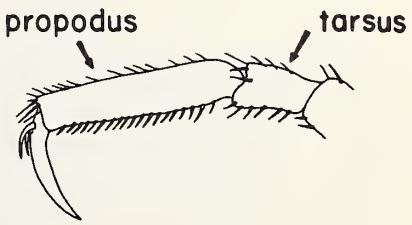
1 Chelifores or palpi, or both, lacking or greatly reduced. 8



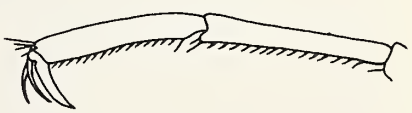
2 (*1*) Chelifores well developed, overreaching proboscis; palpi five-jointed. ..... NYMPHONIDAE .. 3



2 (*1*) Chelifores shorter than proboscis, and chelae reduced to knobs; palpi seven to nine-jointed. ..... AMMOTHEIDAE .. 7

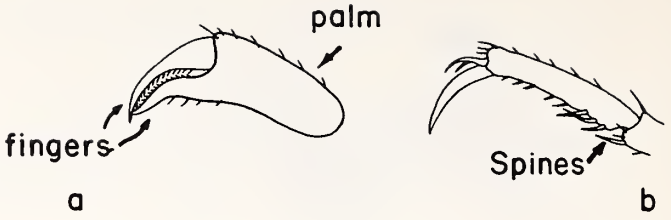


3 (*2*) Tarsus half as long (or less) as propodus. ..... *Nymphon hirtipes*

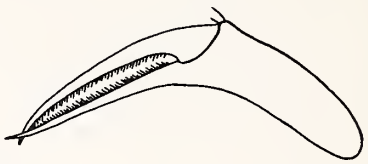


3 (*2*) Tarsus almost as long or longer than propodus. 4

4 (*3*) Fingers of chelae comparatively thick, shorter than palm (a); a few large spines on sole of propodus (b). .....
.....*Nymphon grossipes*



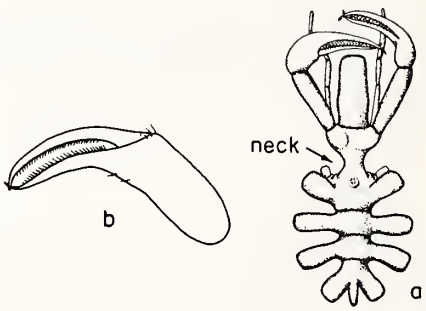
4 (*3*) Fingers of chelae slender, usually as long or longer than palm; without large spines on sole of propodus. 5



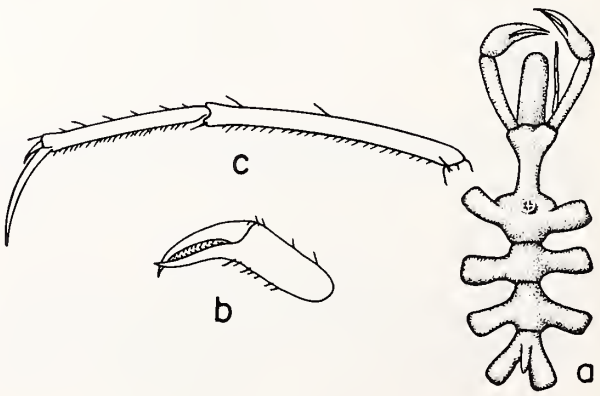
5 (*4*) Auxiliary claws one-half to two-thirds as long as terminal claw. ..
..... *Nymphon macrum*

5 (*4*) Auxiliary claws less than one-fourth as long as terminal claw. 6

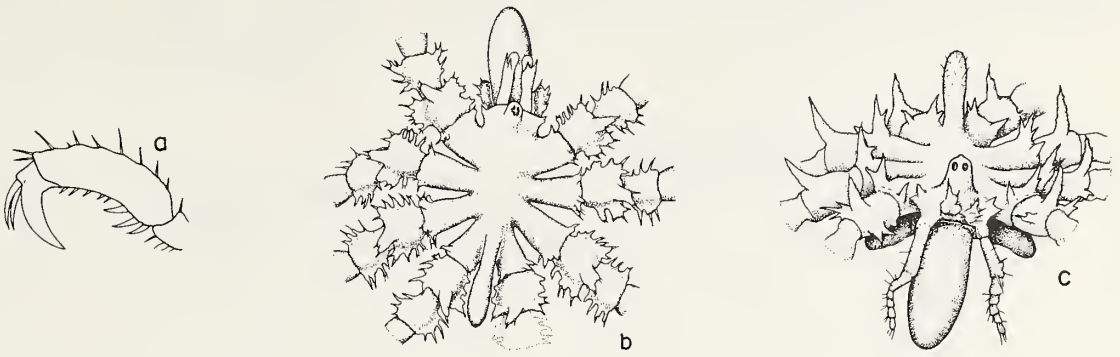
6 (*5*) Neck short (a); chelae with more than 25 large spinules on each finger (b). ....
..... *Nymphon strömi*



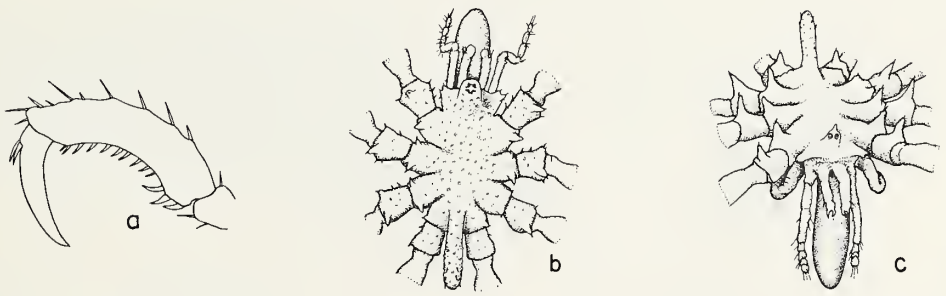
6 (*5*) Neck long, slender (a); chelae with 25 or less spinules on each finger (b); tarsus at least one and a half times as long as propodus (c). .....*Nymphon longitarse*



7 (*2*) Auxiliary claws at least half as long as terminal claw (a); lateral processes narrowly separated (b, c) ..... *Achelia spinosa*



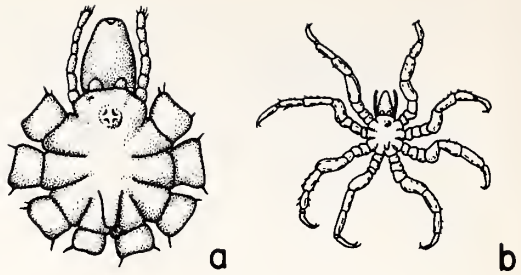
7 (*2*) Auxiliary claws less than one-third as long as terminal claw (a); lateral processes contiguous (b, c). ..... *Achelia scabra*



8 (*1*) Chelifores or palpi lacking, but not both. 9

8 (*1*) Chelifores and palpi both lacking. 15

9 (*8*) Chelifores lacking or greatly reduced (a); palpi five- or six-jointed; very small (body length less than 4 mm) (b). . *Tanystylum orbiculare*

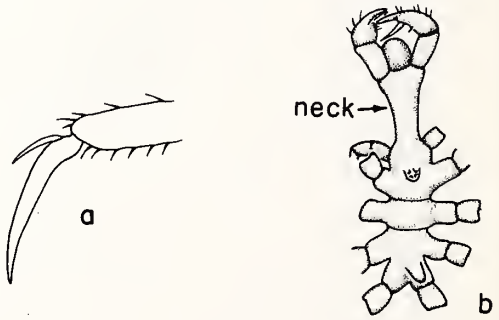


9 (*8*) Chelifores present, palpi lacking. 10

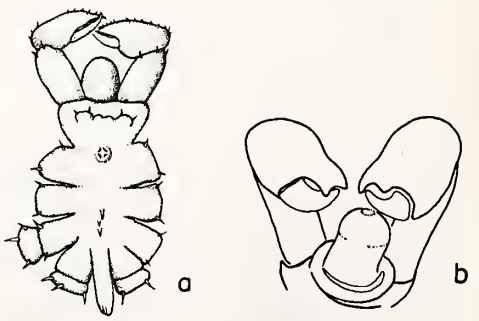
10 (*9*) Ovigers 10-jointed; present in both sexes. . . . . CALLIPALLENIDAE 11

10 (*9*) Ovigers less than 10-jointed; ovigers in male only. . . . . PHOXICHILIDIIDAE 12

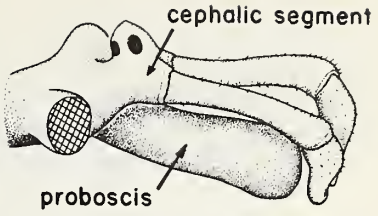
11 (*10*) Auxiliary claws present (a); neck longer than wide (b); lateral processes widely separated. . . . . *Callipallene brevirostris*



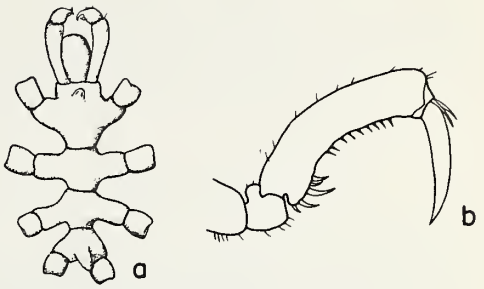
11 (*10*) Auxiliary claws absent; neck short and broad (a); body compact and oval, with lateral processes narrowly separated (a); chelae heavy (b). . . . . *Pseudopallene circularis*



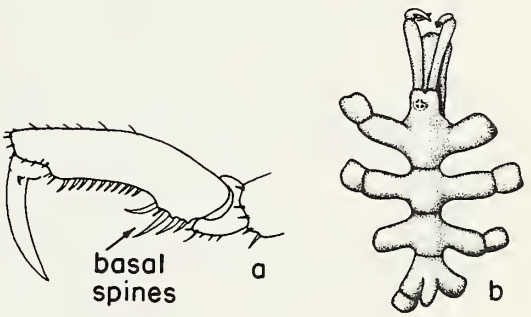
12 (*10*) Cephalic segment extended forward as a conspicuous neck, overhanging insertion of proboscis; auxiliary claws extremely minute or absent. 13



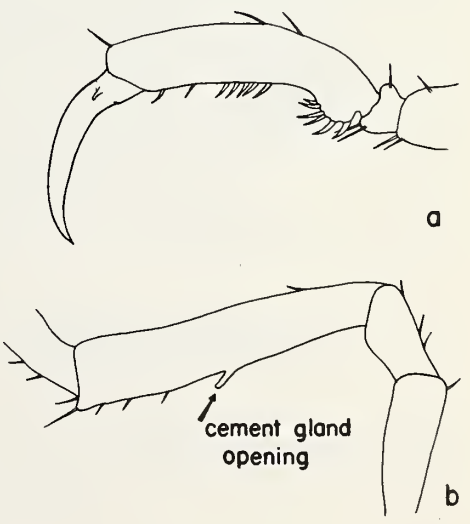
12 (*10*) Cephalic segment not extended forward (a); auxiliary claws present (b). ..... *Phoxichilidium femoratum*



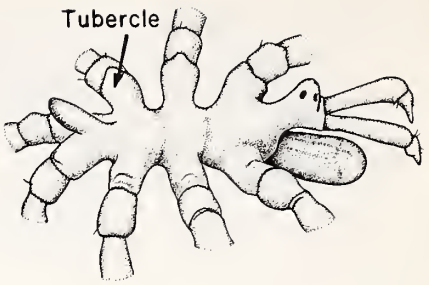
13 (*12*) Body length of adult greater than 5 mm (b); basal spines on propodus at least half as long as width of propodus (a); cement gland opening on femur of male a simple slit. ..... *Anoplodactylus lentus*



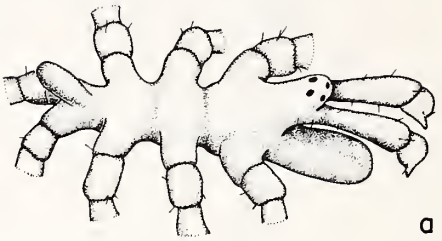
13 (*12*) Body length less than 2 mm; basal spines on propodus less than half as long as width of propodus (a); cement gland opening in femur of male located at tip of raised tube (b). 14

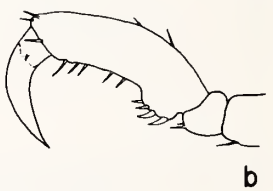


14 (*13*) Body length of adult larger (typical specimens about 1.5 mm); with very low tubercles on lateral processes. . . . . .
. . . . . *Anoplodactylus petiolatus*

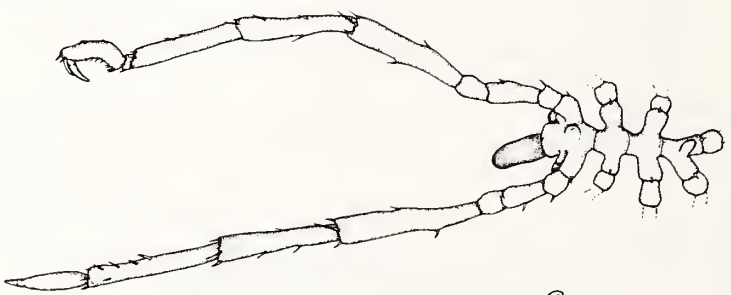


14 (*13*) Body length generally smaller (1 mm or less); no tubercles on lateral processes (a); comparatively fewer spines on legs (b). . . . . *Anoplodactylus parvus*

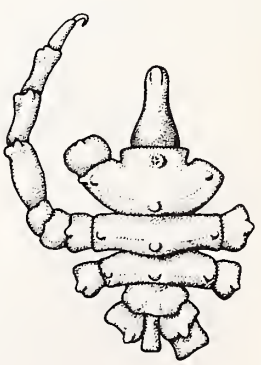




15 (*8*) Body slender; legs about twice as long as body; auxiliary claws present. . . . . ENDEIDAE. . . . . *Endeis spinosa*



15 (*8*) Body stout; legs short, not much longer than body; without auxiliary claws. . . . . PYCNOGONIDAE
. . . . . *Pycnogonum littorale*



ANNOTATED SYSTEMATIC LIST

Listed in the order species appear in the key.

Family NYMPHONIDAE

Nymphon hirtipes Bell, 1853. Generally in deeper waters, 45 to 400 m, off northern New England and northward.

Nymphon grossipes (O. Fabricius?) Krøyer, 1780. Commonest species of *Nymphon* in New England. Collected from 20 to 1,050 m.

Nymphon macrum Wilson, 1880. Mostly north of Cape Cod, though some records exist from as far south as Florida. Reported from 64 to 1,540 m; muddy bottoms.

Nymphon strömi Krøyer, 1844. Taken in New England from 12 to over 900 m. Occurs mostly north to latitude 82°, but there are a few records from south to Florida.

Nymphon longitarse Krøyer, 1844. Occurs north of Cape Cod, especially in the Gulf of Maine, from 30 to 280 m.

Family AMMOTHEIDAE

Achelia spinosa (Stimpson) Wilson, 1853. Considered uncommon. Recorded from Block Island to New Brunswick in depths less than 37 m. Specimens #1220C and #1220N, in the Gray Museum, Marine Biological Laboratory, Woods Hole, Mass., collected at Fishing Ledge, Cape Cod Bay. See comments under *A. scabra.*

Achelia scabra Wilson, 1880. Very few specimens in existence, all from localities north of Cape Cod, Mass. Two specimens in the Gray Museum of the Marine Biological Laboratory (lot #1220D) collected at Fishing Ledge in Cape Cod Bay, at a depth of 25.9 m. As happens for several of the few preserved specimens in existence, these were collected together with *A. spinosa. A. scabra* reportedly differs from *A. spinosa* in having: (1) reduced length of auxiliary claws, (2) shorter lateral processes which are closely pressed together, (3) reduced spinous tubercles on the coxa, and (4) large tubercles on the posterior outer corners of the lateral processes. None of these characters seem to be consistent, except for length of auxiliary claw. Though no gradation in length of auxiliary claw is obvious, the degree of spination, size, and general appearance does intergrade to such an extent as to cast some doubt on whether *A. scabra* and *A. spinosa* are separate species.

Tanystylum orbiculare Wilson, 1878. A relatively common littoral species found in a variety of fouling communities from Cape Cod south to the Caribbean and Brazil. Found also on floating *Sargassum.*

Family CALLIPALLENIDAE

Callipallene brevirostris (Johnston), 1837. A relatively common littoral species found from Cape Cod to Florida.

Pseudopallene circularis (Goodsir), 1842. An uncommon species taken in deeper shelf water (22 to 100 m) from Cape Cod north to Arctic. Rarer in southern part of range.

Family PHOXICHILIDIIDAE

Phoxichilidium femoratum (Rathke), 1799. A common species found in the intertidal zone to 100 m from Long Island Sound to Greenland.

Anoplodactylus lentus Wilson, 1878. A common species from the south shore of Cape Cod to the Caribbean, from the intertidal zone to the shelf edge.

Anoplodactylus petiolatus (Krøyer), 1844. *A. petiolatus* and *A. parvus* may be the same. Small differences in size have been used to differentiate the two, and a careful examination of a large series probably would reveal gradations. Both have been taken from floating *Sargassum.* Represented in the Gray Museum by lots #548 (*A. petiolatus*) and #2094 (*A. parvus*).

Anoplodactylus parvus Giltay, 1934. See comments under *A. petiolatus.*

Family ENDEIDAE

Endeis spinosa (Montagu), 1808. Specimens usually come from pelagic *Sargassum* weed washed ashore. Not common in the New England area.

Family PYCNOGONIDAE

Pycnogonum littorale (Strom), 1762. Ranges from the intertidal zone to off the shelf from Maine to Long Island Sound.

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The Board established the format for the "Marine Flora and Fauna of the Northeastern United States," invites systematists to collaborate in the preparation of manuals, reviews manuscripts, and advises the Scientific Editor, National Marine Fisheries Service.

The illustrations were drawn by Susan P. Heller of the Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Mass. Eva S. Montiero typed the manuscript. Preparation of the manual was supported in part by Grant GB-24,832 from the National Science Foundation and by a grant from the Whitehall Foundation to the Systematics-Ecology Program.

COORDINATOR'S COMMENTS

Publication of the "Marine Flora and Fauna of the Northeastern United States" is most timely in view of the growing universal emphasis on environmental work and the urgent need for more precise and complete identification of coastal organisms than has been available. It is mandatory, wherever possible, that organisms be identified accurately to species. Accurate scientific names unlock the great quantities of biological information stored in libraries, obviate duplication of research already done, and make possible prediction of attributes of organisms that have been inadequately studied.

Dr. McCloskey commenced his study of the systematics of the Pycnogonida in 1964. Preliminary drafts of this manual were prepared in the spring and summer of 1971 during a portion of Dr. McCloskey's tenure in the Systematics-Ecology Program as a Postdoctoral Fellow sponsored by the Whitehall Foundation. He joined the staff of the Department of Biology, Walla Walla College, College Place, Washington, in the fall of 1971.

Manuals are available for purchase from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The manuals so far published in the series and their cost per copy are listed below.

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